



Theodor Arldt (1878–1960): Parochial Pauker and Pioneering Palaeobiogeographer

MALTE C. EBACH¹ & ELIZABETH M. DOWDING

Palaeontology, Geobiology and Earth Archives Research Centre (PANGEA), School of Biological, Earth and Environmental Sciences, UNSW Sydney, NSW 2052, Australia.

¹Corresponding author. E-mail: mcebach@gmail.com

Abstract

The rise and fall of Theodor Karl Hermann Arldt (1878–1960) took place in Radeberg, a small town in Saxony between 1902 and 1945, where he supported his research by working as a school headmaster or *Pauker*. Within his many scientific papers and books Arldt pioneered palaeogeography and palaeobiogeography by introducing distributional data of living organisms to understand past continental connections. His writings influenced notable scientists such as Alfred Wegener and partially influenced the geological community in which palaeogeography was firmly rooted. While Arldt's biogeographic approach was novel, and in hindsight surprisingly modern, it failed to engage biologists where such a method may have flourished. As a small town *Pauker*, Arldt had little or no contact with universities and university students, leaving a legacy of pioneering publications and ideas but no one to carry them forward into the post-tectonic world of the 1960s.

Key words: Biogeography, Cold War, Continental Drift, land bridges, palaeogeography, palaeontology, palaeobiogeography

Introduction

Not much has been recorded of Arldt and what we know of his early and personal life is limited¹. He was born in Leipzig on January 20, 1878 and was the son of a glazier (Figure 1). Arldt was educated at the Gymnasium Albertinum in Freiberg, Saxony² between 1888–1897 and studied for 8 semesters at the University of Leipzig between 1897–1901 where he completed his doctoral dissertation in 1901, under the renowned geographer Friedrich Ratzel (Arldt 1901). Unsuccessful in his attempt to pursue a university career³, Arldt settled in the Bierstadt (Beer town) of Radeberg in Saxony at the Höhere Knabenschule during Easter in 1902⁴. There he remained for 56 years, teaching students, publishing scientific texts and contributing to cultural life in Radeberg. Arldt died on Armistice Day 1960 during the height of the Cold War. His obituary, anonymously written on behalf of the Cultural Association of the German Democratic Republic (Eastern Group), talks of a conciliatory person, “a reliable colleague, friend and teacher of youth” someone the Association honoured as “our Professor”⁵ whose

1. All of Arldt's correspondence was destroyed after his death in 1960 (Gotte 1993). Much of what we do know is extracted from personal accounts recorded in an obituary (Anon. 1961); a biography written by his student Wolfgang Gotte (Gotte 1993; see also Banda 1957; Anon. 2017), through Arldt's own *Vitae* (Arldt 1901) and state records (<http://saebi.isgv.de/suche/?snr=19425> accessed January 27, 2017).
2. Gymnasium Albertinum was known after 1948 as the Geschwister School Gymnasium Freiberg, Saxony.
3. In 1927–1928 Arldt applied for the Chair of Geology and Palaeontology at the University of Greifswald, however, the position went to Serge von Bubnoff (1888–1957) (Gotte 1993).
4. He spent a year as the assistant head master (*Hilfslehrer*) at the Realschule in Meerane in Saxony during 1901–1902. In Easter 1902 Arldt transferred to the Höhere Knabenschule in Radeberg, which was upgraded to a Realschule in 1904. In 1912 the school moved to new premises on Am Freudenberg, which is now the Humboldt-Gymnasium Radeberg. By 1914 Arldt was a School Master (*Oberlehrer*) and was promoted to Professor in 1917 (Anon. 1961). He also held the positions of Deputy Head (*Konrektor*) by 1927 and School Head (*Rektor*) by 1945.

“memory will live on!” (Anon. 1961, p. 125). The Cultural Association was part of the politically motivated National Front of the German Democratic Republic (GDR). His obituary listed his work for “Partei und Kulturbund” as “exemplary”⁹, over-looking his political membership during the Second World War.

Arlt’s influence seemingly revolved around the small town of Radeberg and its inhabitants, many of whom were unaware of his international status as a leading palaeogeographer. While many of his cultural contributions were recorded in local newspapers and newsletters during his life-time and into the present-day⁶, little is known of Arlt’s private life⁷ apart from what is recorded in his obituaries. In contrast, we know a lot about Arlt’s scientific endeavors given his output was prolific before, during and between both World Wars⁸. Arlt is listed as a member of the German *Geological Society* (*Geologische Vereinigung* Anon. 1921, 1943), the German *Palaeontological Association* (*Palaeontologischen Gesellschaft* Jaekel 1914; Anon. 1928) and an *Honorary Member of the Society for Geography, Dresden* (*Verein für Erdkunde zu Dresden* (Anon. 1938).

In 1945 Arlt’s career as scientist and schoolmaster ended abruptly. Arlt was dismissed from his post due to his involvement in the Nazi Party (*Nationalsozialistische Deutsche Arbeiterpartei*). He stopped contributing to the scientific literature and continued with his homeland (*Heimat*) writings (e.g. Arlt 1955; see Anon. 2016a), producing works on local cultural as well as giving public lectures on various topics including natural history (Gotte 1993). The disappearance of Arlt from the scientific literature, his absence from membership rolls of both the Geological Society and Palaeontological Association, and the start of Cold War might have led some in the west to believe that he had died. Perhaps this may be why the now West German *Geologische Vereinigung* announced his death prematurely by eight years in their publication the *Geologische Rundschau* (Anon. 1952).

Arlt’s seminal works were ahead of their time, and their impact on notable figures like Alfred Wegener, have left a legacy. However, Arlt’s choice to disseminate his predominately biological ideas to a primary geological audience, his lack of an academic position and students and his association with politics, led to his downfall. However, it is through Arlt’s surviving scientific work that we find a careful thinker who attempted to unify the fledgling field of palaeogeography.

Pioneering Palaeogeography

Arlt was the first to formalise palaeogeography as a discipline with a methodology and theoretical foundation. He defined it as “the study of the former conditions of the Earth” (Arlt 1907, p. iii)⁹.

-
5. His student Wolfgang Gotte recalls Arlt being referred to as a *Pauker* (a Crammer), school-boy slang meaning a teacher who crams his students full of facts (Gotte 1993). *Pauker* were usually university educated with doctoral degrees unable to get work within the university system as academics. Instead they took up high school positions and many became disinterested teachers, full of facts but with no passion for teaching. Gotte (1993) reveals Arlt’s nickname as *Asch*, a misspoken pronunciation of the term *Anstand!* (Manners!), which he often called out when the students became unruly.
 6. These include the now defunct newsletter *Radeberger Kulturleben: Heimatschrift für Radeberg und Umgebung* (1945–1989), and in the current local newspaper *Die Radeberger Heimatzeitung* (founded in 1991). On September 09, 2016, *Die Radeberger* announced “Der Tage das Friedhofs” (Day of the Cemetery), which Radeberger chroniclers are remembered via guided tour through the local cemetery. Arlt is one of those remembered as recording the history of the township (Anon. 2016b).
 7. A notable exception is his home addresses in Radeberg, which were listed in various societal membership pages in leading German scientific journals. The addresses varied between “Badstr. 14” during the German Empire (Jaekel 1914, p. 438); “Badstr. 13” during the Weimar era (Anon. 1921, p. 277; Anon. 1928, p. 268; Anon. 1930, p. 68); a notification of change of address listed “Adolf-Hitler-Str. 13” during Nazi Germany (Anon. 1937, p. 383; Badstrasse was renamed see *Radeberger Blätter zur Stadtgeschichte* Vol. 10), and another in 1940 gave “Pulsnitzer Str. 40” (Anon. 1940, p. 320), where he lived until the post-war German Democratic Republic (Anon. 1948, p. 67). His place of death is listed as “Arnsdorf bei Radeberg” (<http://saebi.isgv.de/suche/?snr=19425> accessed January 27, 2017), which is also the location of the local hospital since 1912.
 8. The second edition of Arlt’s *Die Entwicklung der Kontinente und ihrer Lebewelt* was destroyed as a result of bombing during the end of Second World War while in production at the publisher Gebrüder Borntraeger Verlagsbuchhandlung in Berlin (Gotte 1993).



FIGURE 1. Prof. Dr. Theodor Arldt (ca. 1960), oil painting by Martin Lehnert (1910–1992), owned by Museum Schloss Klippenstein Radeberg. Other images of Arldt are in found in Gotte (1993, Bd. 1) “Prof. Dr. Theodor Arldt Konrektor am Realgymnasium zu Radeberg (1927)”, and in a group photo of the 1929 Sächsischer Gebirgsverein (in back row, third from right), Sparate Radeberg (Gebauer & Altmann 1999 p. 91). Both images are available at: https://de.wikipedia.org/wiki/Theodor_Arldt

9. Historian Mott Greene (2015, p. 245) believes this shows how novel the field was in 1907, but it also shows us how varied the field was, as almost any historical scientific field can fit within that definition (e.g., geology, palaeontology, archeology, palaeobiology). In 1919 Arldt uses his 1910 & 1913 definition “Geography of all past periods of the Earth’s history since the final consolidation of the Earth’s crust” [“Geographie aller vergangenen Perioden der Erdgeschichte seit der endgültigen Verfestigung der Erdkruste”] (Arldt 1919, p. 36; Arldt 1913, p. 152; Arldt 1910, p. 229). By 1921, Arldt still considers palaeogeography to be a young discipline, but indicates that the field is often considered to be a sub-discipline of historical geology (i.e., lacking a biogeographic method) (Arldt 1921, p. v).



FIGURE 2. Biogeographic classification of the Continents (*Biogeographische Gliederung der Kontinente*, Arldt 1907, map 1). Much of Arldt's work focused on redefining the Sclater-Wallacean regions synthesised from newly published data.

Up until the early 20th century palaeogeography was a vague set of ideas that surrounded the construction of maps detailing the former coastlines of continents based on geological inferences. Given this, 19th century palaeogeography can be considered a sub-discipline of historical geology that featured in larger works on geology. Early examples used petrographic and sedimentological data to infer coastlines, such as Eduard Suess's *Das Antlitz der Erde* (Suess 1883–1904) and James Dana's *Manual of Geology* (Dana 1863), with newer approaches like that of Melchior Neumayr (1885), who incorporated a palaeontological element to palaeogeography. The most notable was Alfred Russel Wallace's *Geographical Distribution of Animals* (Wallace 1876), who looked at modern plant and animal distributions to work out past continental connections. Palaeogeography, during Arldt's lifetime, was a field embedded in other disciplines, leading Edgar Dacqué to compare it to a fire “that for a long time had glowed under a lid but now has burst forth” (Dacqué 1913, p. 189).

Arlt's own journey into palaeogeography started in 1901 with the publication of his thesis *Über den Parallelismus der Küsten von Südamerika* (Arlt 1901). The work formed the basis of the now discredited Tetrahedral hypothesis, an idea that Arldt supported throughout his scientific career. In his thesis we find the kernel of his later works (Arlt 1907, 1919, 1921, 1938), namely the notion that the oceans were not, as many believed, permanent. Arldt used the distributions of a whole range of organisms in reconstructing former land bridges between continents. For example, Arldt (1907) argued that the Caribbean Sea first appeared in the Tertiary and the canal connecting it to the Pacific closed in the Pliocene based on zoogeographical relationships. Arldt's combination of geological history, the distribution of organisms (including fossils) and the geography of continents and ocean basins created a unique version of palaeogeography.

After a hiatus between 1902–1904, Arldt published a great deal on palaeogeography leading to his 1907 *Die Entwicklung der Kontinente und ihrer Lebewelt* (The development of the continents and the whole biological world of flora and fauna past and present)¹⁰ his most known and cited work. *Die Entwicklung* is perhaps the most detailed

study on the distribution of life in the early 20th century, with no work rivaling it since. Arldt reviewed the entirety of the zoogeographical and phytogeographical literature in order to establish a set of biogeographical regions, phylogenetic trees, plant and animal distributions, dispersal routes and palaeogeographic reconstructions in a set of 23 maps (Figures 2–4). The 730 page tome also systematically outlined the palaeogeographic method, possibly for the first time. The first chapter also discusses the permanence of the oceans and continents, concluding that they changed over time. What makes Arldt depart from other palaeogeographers is that he used the distributions of living and fossil organisms, in addition to geology, to prove his point.¹¹ Compare this to Austrian Geologist Franz Kossmat's *Paläogeographie*, a textbook that focuses on fossil bearing rocks and sediment, and what these tell us of the past environments. Perhaps it is not surprising that Kossmat describes Arldt's work as “predominantly biogeographic” (Kossmat 1908, p. 7)¹², a view that is shared by US geologist Benjamin Kendall Emerson who stated that “two thirds of the book is devoted to a biogeography of the past and the present” (Emerson 1917, p. 445).

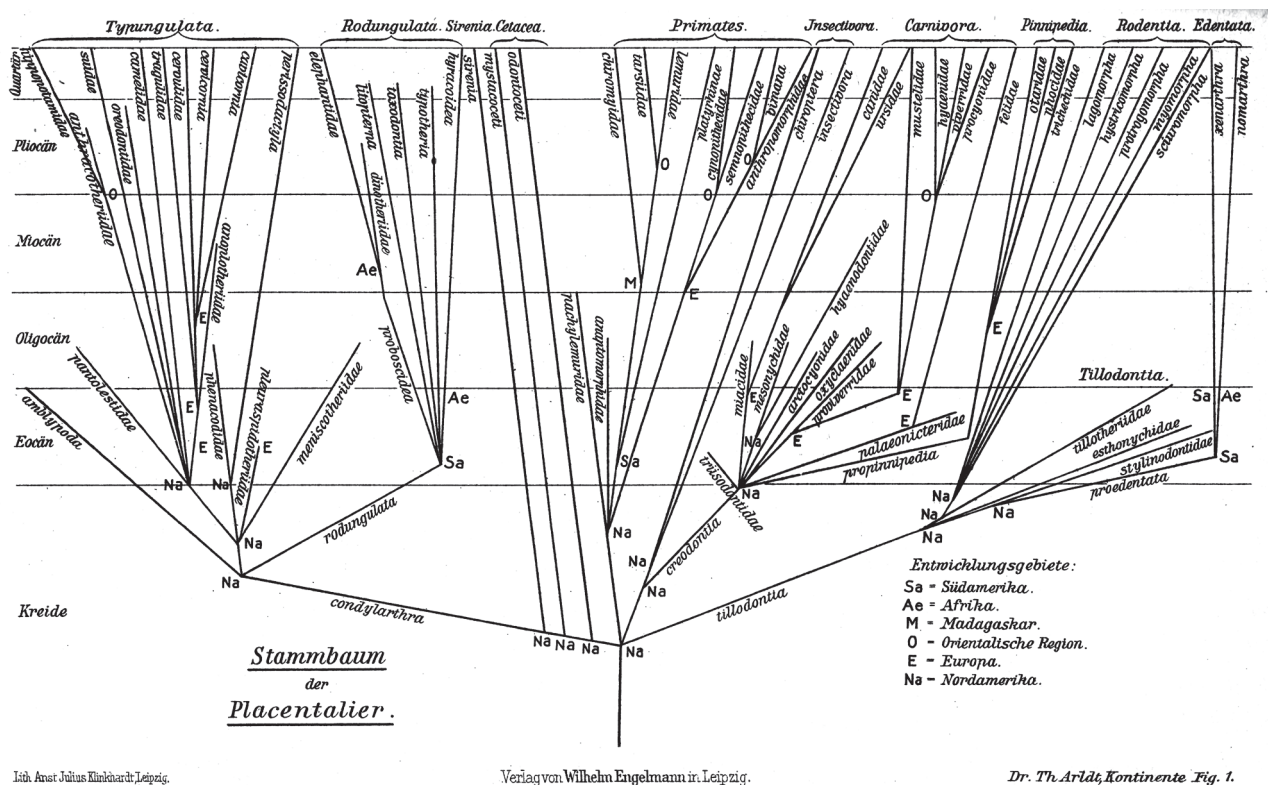


FIGURE 3. Placental phylogeny (*Stammbaum der Placentalier*; Arldt 1907, figure 1). Note the biogeographic regions and time (period and epochs) mapped onto a phylogenetic tree. Arldt's *Stammbaum* is similar to a modern day taxon-area cladogram (with a temporal aspect), an idea that was independently introduced 59 years later by Lars Brundin (Brundin 1966).

The second part of Arldt's tome is perhaps the most important. The text systematically described the boundaries of each biogeographic region and discusses the biogeographic distributions of plants and animals over

10. *Lebewelt* (not to be confused with *Lebenswelt* or “environment”) is an unusual term that may be translated as “the living world”, “the world of living creatures”, “biota”, “biosphere”, or “the whole biological world of flora and fauna past and present” (see Moran 2012, p. 114). The latter translation is the most accurate given the breath of Arldt (1907).
11. Arldt stated “If the paleogeographer is concerned with proving the earlier distribution of land and sea and the former presense of land bridges instead of the present-day seas, or ocean basins and land masses, then the results of two sciences are at his disposal, geology and biogeography” “Wenn es sich für den Paläogeographen darum handelt, die frühere Verteilung von Land und Meer, das ehemalige Vorhandensein von Landbrücken an Stelle von heutigen Meeren oder von Ozeanbecken anstatt von Landmassen nachzuweisen, dann stellen ihm dafür besonders zwei Wissenschaften ihre Ergebnisse zur Verfügung, die Geologie und die Biogeographie” (Arldt 1924, p. 384).
12. Both Kossmat and Arldt published second editions of their works in 1936. At the time Kossmat was director of the Geological Survey of Saxony and the director of the Geological-Paleontological Institute of the University of Leipzig.

time. Each description is accompanied by a list of endemic taxonomic families to each region, their relationship to organisms in other regions and their dispersal routes. Arldt reads more like Wallace than the traditional palaeogeographical literature, such as Dacqué and Kossmat. For example, in describing the Australian region, Arldt divided the entire fauna into three layers or strata (*Schichten*)¹³, namely, the Monotremen-Schicht (dispersed from India during the Mesozoic), Marsupialier-Schicht (dispersed from Patagonia during the Eocene) and the Murdien-Schicht (dispersed from India during the Pliocene). The book also includes a historical section, which describes the distributions of plants and animals, continents and their mountain chains during the Neogene, Mesozoic and Palaeozoic.

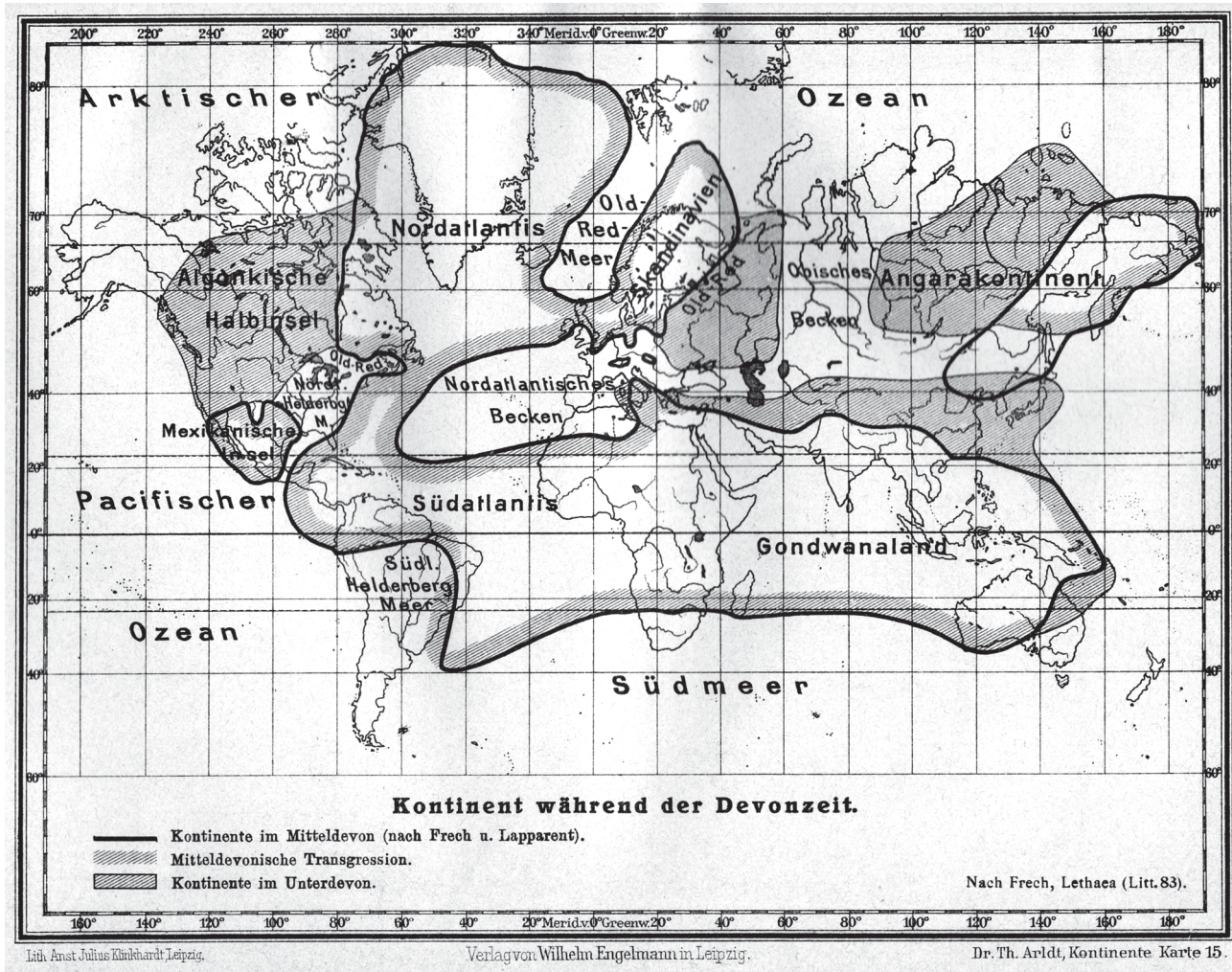


FIGURE 4. Continents during the Devonian (*Kontinent während der Devonzeit*, Arldt 1907, map 15). Arldt's maps clearly show land bridges derived on the distributions of past biota and their environments.

The difference of Arldt's palaeogeography can be seen in his historical review of palaeogeographic reconstructions (Arldt 1914). In this review, Arldt considers palaeogeography to extend to biogeographic studies that attempt to map biotic distributions across continents, regardless of whether this is done cartographically or descriptively. Compare this to earlier historical reviews by US geologist Charles Schuchert (Schuchert 1910) and Dacqué (1915), in which the discussion is largely confined to the geological and palaeontological literature. Arldt was clearly inspired by Wallace in that he included biogeography, and in turn biology (e.g., taxonomy, phylogenetics), into the remit of palaeogeography which he coined 'palaeobiogeography' (Arldt 1909). For Arldt geography could not function without geological concepts, in the same way biology could not function without phylogenetics and palaeontology. Here lies perhaps the greatest weakness in Arldt's work, namely, the merging of geology and biology. Wallace had achieved this successfully on the back of evolutionary theory, however, Arldt

13. "Schicht" is identical to the term "Element" in the contemporary Australian literature (see Ebach 2017).

attempted to do this using palaeogeographic reconstructions, an area that was considered by many to be exclusively geological in nature.

Regardless, Arldt's palaeobiogeography resembled Wallace's biogeography and many geologists and geographers reviewing Arldt's work considered it to be predominantly biological. In contrast, Kossmat's *Paläogeographie und Tektonik* ignored biogeography altogether (Kossmat 1936), while Schuchert dedicated only 4 pages to biogeography in his famous *Historical geology of the Antillean-Caribbean region* (Schuchert 1935). Compare this to the 191 pages Arldt devotes in his second volume of the *Handbuch der Palaeogeographie* (Arldt 1921) and the entire first part of the second edition of *Die Entwicklung* (Arldt 1938). In the 1938 foreword, Arldt remained committed to combining new results from geology but also those from biogeography as well¹⁴. Arldt's insistence on using the biogeographic method, that is, to use animal and plant distributions (in addition to geology) to draw reconstructions, may have had a negative impact on his career within the palaeogeographic community.

The Legacy of Arldt

Reception of Arldt's work was mixed. In a staggering 10 page review, Fritz Frech, a German professor of Geology at the University of Breslau, called it the combined work of a team of specialists, but was critical of its geological conclusions, particularly the Tetrahedral hypothesis (Frech 1908)¹⁵. Geographer Martha Krug Genthe¹⁶ stated, “an adequate review of the book would require the combined efforts of a geologist, biologist, palaeontologist, physicist, astronomer, chemist and others” (Genthe 1910, p. 296). A review in the *Geographical Journal* was less generous, admitting it contained “a vast store of information” it did however warn, “many of the authors’ conclusions and opinions should be compared with those of other authorities before being definitely accepted” (R.L. 1908, p. 173). Geologists would have found Arldt's work too biogeographic, although British geologist John Walter Gregory considered Arldt's book to be the “fullest statement yet issued of the doctrines of a school of thought [...] and shows the necessity for the combined study of palaeontology, geology, and petrography in discovery of the actual history of the geography of our earth” (Gregory 1908, p. 267). What many of the geologists and geographers seemingly have missed is the use of living plant and animal distributions to make assumptions about the past positions of biogeographical areas in respect to continental margins and ocean basins. It is therefore not surprising that geologists read Arldt as being easy on the geology and heavy on the biology¹⁷. However, it is difficult to gauge what the biological community thought of *Die Entwicklung*, as the title does not suggest any biological content, nor were there any reviews in biological journals. Despite lukewarm reviews, *Die Entwicklung* was regularly cited by palaeogeographers in the pre-war period, particularly by German meteorologist Alfred Lothar Wegener.¹⁸

Wegener (1912) relied on Arldt (1907) “quite heavily” for the existence of continental biotic connections (Greene 2015, P. 242)¹⁹. Wegener's found Arldt's biogeographic synthesis, based on the revision of the taxonomic and phylogenetic literature, appealing²⁰. Historian Mott Greene²¹ states that in 1911 Wegener may have extracted

-
14. In his foreword to the second volume of his *Handbuch der Palaeogeographie* Arldt also noted: “So erschien es mir nötig, die Palaeogeographie nicht bloß in dem gewöhnlichen Umfange zu behandeln, sondern ihren Begriff möglichst weit zu fassen und zusammenzustellen, was auf geologischem wie auf biologisch-geographischem Wege sich nicht bloß über die frühere Verteilung von Land und Meer ermitteln ließ ...” [“It seemed necessary to treat paleogeography not only in the ordinary extent, but rather to comprehend and compile it as far as possible, which could be determined by geologic as well as by biological and geographic methods only through the earlier distribution of land and sea”] (Arldt 1921, p. iii, our translation).
 15. Emerson (1917) reviews both Arldt's book and the Tetrahedral hypothesis in general.
 16. Genthe also studied under Ratzel at the University of Leipzig at the same time as Arldt. In 1900 she transferred to the University of Heidelberg where she completed her doctorate under Hettner. Genthe was probably the first woman to be awarded a doctorate in geography (Martin 2015).
 17. A review of the greatly enlarged second edition attracted similar criticism from geologists and geographers. Some were deterred by the length and biogeographic scope of the work, which were “sufficient to deter anyone except a systematic zoologist” (P.L. 1938, p. 89) or found the biogeography “exceedingly detailed” (H.H.R. 1937). Others claimed there to be “little novelty” (J.D.M. 1937, p. 84). Fellow high school teacher and geologist Georg Wagner considered it primarily a reference book, but noted uncertainty in Arldt's conclusions (Wagner 1938).
 18. As well as South African geologist, Alexander Logie du Toit, who cited Arldt (1919) in context to land bridges in his landmark *Our Wandering Continents* (du Toit 1937).

the same information from Suess' *Das Antlitz*, Gustave Émile Haug's *Traité de Géologie* (Haug 1907) and Friedrich Heinrich Emanuel Kayser's *Lehrbuch der allgemeinen Geologie* (Kayser 1909). But these works were geological, written by geologists, and did not engage with the biogeographical literature in the same depth as Arldt, nor did they systematically compare the ideas of practising palaeogeographers²². In other words, Arldt introduced new evidence that came from the palaeontological and biological literature. Moreover, Arldt produced a series of multicoloured distribution maps. The ease of access to large sums of data through maps is possibly what made Arldt's work appealing to Wegener²³. Wegener also consulted Arldt further including the synopsis of twenty hypothesised intercontinental land bridges (Wegener 1924, p. 73, fig. 15; see also Frankel 2012, p. 88, Greene 2015, p. 414 and Jacoby & Wutzke 2013, p. 11).

Overall it would be prudent to suggest that Arldt's work influenced Wegener's greatly. The evidence of biotic connections considered, only Arldt had the foresight to synthesise it into a biogeographic treatise. More importantly, Arldt wrote from the standpoint of a practicing palaeogeographer, meaning that he was far more effective in disseminating his findings, mostly through the usage of maps. While Arldt was read by palaeogeographers internationally, it would be accurate to suggest that Arldt came to the attention of historians due to Wegener, perhaps explaining why a large part of his work on palaeobiogeography (and other topics) is overlooked in most historical treatments²⁴. Even so, a large portion of Arldt's work was under-represented in much of the post 1960s literature of the tectonic age, even though Arldt's methods would be familiar to a modern day palaeobiogeographer.

Arldt produced a large swathe of publications, including one paper in 1909 in which he coined the term palaeobiogeography²⁵ as well as other works that broached subjects as far reaching as cultural and political geography²⁶ (e.g., Arldt 1916, 1929), anthropology, evolutionary theory (Arldt 1932) and geophysics (Arldt 1905). Regardless, Arldt did not enjoy the popularity of his colleagues, such as Suess, Frech, Dacqué, and Kossmat. His palaeogeographic work may have been considered as being too biogeographic in nature and his area of interest too broad for a specialist in any one field. In addition, it is uncertain to say whether Arldt had much contact with his contemporaries such as Kossmat (based nearby at the University of Leipzig) or others like Schuchert²⁷.

It could be argued that Arldt was ahead of his time, or that he simply did not engage with a biological (e.g., phytogeographic and zoogeographic) audience. Perhaps Arldt was in the wrong place at the wrong time. Compare Arldt's career to Charles Schuchert, we find someone who was in the right place at the right time. Born in Cincinnati, Ohio in 1858, Charles Schuchert was a self-taught palaeontologist who worked managing his father's furniture business. At 26 Schuchert decided to pursue a career in palaeontology, having only achieved sixth grade at grammar school followed by a year at college and night school, becoming one of the last professional geologists

-
19. English geologist Robert Heron Rastall stated: "The whole subject of land bridges of this type has been well summarized by Wegener, who based his discussion largely on the work of Arldt" (Rastall 1929, p. 450). Paul F. Hoffmann noted through Arldt (1907) "Wegener learned of the remarkable similarities in Mesozoic flora and fauna between Brazil and Gabon, and also of the concept of sunken 'land bridges' then widely invoked by geologists to account for such linkages" (Hoffmann 2012, p. 104). Gotte (1989, p. 129) suggested that Arldt may have had some correspondence with Wegener, however, all of Arldt's private letters have been destroyed.
 20. Wegener, however, disagreed with Arldt's geological interpretations (as well as those of Hermann von Ihering), particularly the connections between continents based on land-bridges (see Bowler 1996, p. 416).
 21. Greene states: "Indeed, any major textbook of the period [...] would have provided him with lists of identical fossil species on both sides, drawing of sunken Atlantic paleocontinents, maps of the extension of European mountains to the Americas" (Greene 1984, p. 749). Greene's attitude changed in 2015 "Nearly as valuable as either of these two sources [Suess and Krümmel] was the comparative treatment of the development of life-forms on the continents throughout geological history provided by Theodor Arldt [1907]" (Greene 2015, p. 245).
 22. For example, Fritz Kerner-Marilaun's *Paläogeographie mit besonderer Rücksicht auf die Fehlerquellen* (Kerner-Marilaun 1934) was reviewed in the *Journal of Geology* as deserving "the consideration of geologists in both the physical and biological aspects of the science [palaeogeography]" (Krumbein 1936, p. 223). The biological aspects here are strictly palaeontological. Austrian geologist Fritz Kerner-Marilaun (1866–1944) is not to be confused with his father, the Austrian botanist and phytogeographer, Anton Fritz Kerner-Marilaun (1831–1898).
 23. Historian Henry R. Frankel noted that these maps were "just the sort of thing to incite Wegener to further examine the geological and paleontological literature" (Frankel 2012, p. 78, footnote 16).
 24. Only a few historians mention Arldt, but generally in connection to Wegener and continental drift rather than to palaeogeography and palaeobiogeography (e.g., Frankel 2012; Greene 2015; Hofsten 1916; Wagenbreth 2014; Le Grande 1988, 2012).

with no formal education (Oreskes 1999). By 1904, at the age of 46, Schuchert was a Professor at Yale and in 1910 came to international attention with his famous *Paleogeography of North America* (Schuchert 1910). The work, written while he was a Professor at Yale, launched his career as a “noted palaeontologist and foremost palaeogeographers of our times” (Dunbar 1943, p. 301). In total, Schuchert was awarded several Gold medals and honorary degrees from New York University, Harvard and Yale (Dunbar 1943) and has a medal named after him²⁸.

The contrast in the lives of these two palaeogeographers is incredible: Schuchert a high-school educated university professor and Arldt a university educated high-school teacher. Schuchert’s career was meteoric and created a lineage of renowned American palaeontologists, while Arldt’s ended up as a *Pauker* in, what was then, a small parochial town on the wrong side of the Iron Curtain. The fall of Arldt had more to do with career choices. If we, however, consider Arldt’s German contemporary, Georg Wagner, we find a well-known geologist employed as a high school teacher in Stuttgart and later a Professor at teacher’s seminary²⁹. Unlike Arldt, Wagner did serve in the First World War, returning badly wounded to a disrupted career. But Wagner took his career further and received his *Habilitation* in 1928, meaning he was allowed to present lectures to university students as a *Privatdozent* (unsalaried lecturer). Wagner’s *Habilitation* had paid off and by 1946 he received an extraordinary professorship in geology, replacing Edwin Hennig who, like Arldt, had to leave due to his involvement in the Nazi Party (Kölbl-Ebert 2016, p. 205). Another possibility for Arldt’s fall may have been due to the boycott of the German language and German and Austrian scientists between 1919–1926 by scientific academies in the Allied nations after World War I³⁰. The ban on Germans attending conferences and publishing in French, Belgium and English scientific journals would have affected all German and Austrian scientists equally. At best it may address why Arldt’s work may not have been read or cited by non-German speaking scientists during the inter-war years. There is also little evidence from academia, that may suggest that Arldt had little contact or interactions with colleagues his own field and in biology (e.g., Festschriften, dedications, societal proceedings or obituaries). As a consequence Arldt’s lack of university teaching and supervision³¹ had led to no students or protégés who could disseminate his ideas further.

Summing up Arldt

Arldt had attempted to combine biogeography with geology, thereby introducing the field of palaeobiogeography, but had little impact on post-tectonic 20th century palaeoscience of the 1960s. To modern palaeogeographers, such as Anthony Hallam, traditional palaeogeographic approaches still relied on the opinions of experts when proposing faunistic connections between continents, while much “of the older literature bearing on past continental

-
25. This is possibly the earliest usage of the term. German palaeontologist Edgar Dacqué suspects Arldt may have coined palaeobiogeography (Dacqué 1915).
 26. The socio-political work of Arldt (1915) argued for the polythetic origin of human races (see Ehrenreich 2007, p. 28); a concept that was well and truly buried since the Kant-Forster race theory debate of the late 18th century (see Ebach 2015).
 27. Arldt reviewed many of the palaeogeographic and biogeographic texts published between 1908 and the 1920s, some not quite so favourably. Kossmat (1908) is criticised for being light on the biogeography, something “which is quite natural for a geologist” (Arldt 1909, p. 235).
 28. The Schuchert Award is presented annually by the Paleontological Society (USA) for significant contributions to palaeontology to someone under the age of 40. Schram (1982) notes that the Schuchert Award had been awarded to the “scientific elite”, citing a similar study made by Zuckermann (1977). Schram’s thesis contended that the Schuchert Award was presented to members of the “Harvard-Columbia-Yale circuit which flows through Dunbar and Newell from Schuchert” (Schram 1982, p. 472). For example, between 1973 to 1979, only 2 medalists were not direct academic descendants of Schuchert.
 29. Wagner was an outspoken critic of extraterrestrial impact craters (Wagner 1962; see Kölbl-Ebert 2016), which were termed “cryptoexplosion structures”, which did not specify a cause (Bucher 1963).
 30. “Allies excluded German scientists and the German language from international associations, congresses and publications, while they created new international scientific organizations under their leadership [...] The boycott was based on the fact that the German scientists had denied German war guilt and war crimes and glorified German militarism in a manifesto ‘To The Civilized World!’ in 1914. The boycott first started in 1919 and had to be abolished in 1926, when Germany became a member of the League of Nations” (Reinbothe 2013, p. 51). The French dominated post-war *Académie des sciences*, led by Émile Picard, supported “the boycott of German science in general as well as mathematics in particular” (Siegmond-Schultze 2009, p. 254; see also Reinbothe 2006 and Lehto 1998).

relationships, as summarised for instance by Arldt (1919–1922), [that] has required or still requires critical revision in the light of modern knowledge and the more rigorous standards of today” (Hallam 1967, p. 204). While Arldt did not break this practice, he did, however, place emphasis on distributional data to redefine biogeographic classification, such as the biogeographic regions proposed by Wallace (1876), as well as using phylogenies to make inferences of biotic distribution. Arldt discarded the notion of a single-taxon bioregionalisations, rather insisting on one set of regions for all taxa. The result was a novel approach that combined the regionalisation of Wallace with the phylogenies of Haeckel, a practice that eventually gained momentum in the late 1960s (e.g., Brundin 1966). In doing so, Arldt produced several striking diagrams that would be familiar to any practicing 21st century biogeographer. To a geologist, Arldt’s palaeogeography was truly puzzling. The emphasis on modern (Cenozoic) biotic distributions and phylogenies made it more biogeography than palaeogeography. Arldt’s work on past continental coastlines and land bridges were seemingly at odds with his work on biogeography. Arldt’s work was never fully embraced by palaeogeographers because it emphasised the biological aspects when the geological would simply do. Biogeographers, who did focus on living taxa and their distributions, had moved on. Zoogeographers had rejected the Wallace view of static regions in favour of dynamic biota, while the phytogeographers principally embraced the ecological approach of vegetation maps and climatic factors (see Ebach 2015). The role of phylogenies and biogeographical classifications was to make a comeback by the end of the 20th century, and by that time Arldt’s work would have been too outdated.

The rise and fall of Theodor Arldt is attributable to someone being in the wrong place at the wrong time. His inability to acquire a tenured position at a university; his lack of students and close collaborators; his work on land bridges in a time of continental drift; his insistence of including extant taxic distributions into a field of extinct organisms were all contributing factors to his life as a *Pauker* in a small East German town. Arldt’s contributions, however, were pioneering and trail-blazing. No one person since Arldt has read and understood the entire biogeographic literature of organisms from the Cambrian to the present nor has a single person synthesised this information into one or more volumes. Arldt is perhaps the first true biogeographer, someone who had synthesised all biotic distributions through time rather than proposing the biogeographic history of their own taxon – something that has only been eclipsed by the work of Léon Croizat (see Craw & Gibbs 1984). Arldt is the first of a long line of 20th century palaeobiogeographic scholars, such as Henri and Geneviève Termier, Anthony Hallam and Art Boucot, to name a few. What was a gargantuan task in the first part of the 20th century would be nigh on impossible in the 21st. Arldt’s work is testament to a true natural history of the Earth.

Acknowledgements

We wish to thank Klaus Schönfuß and Katja Altmann of the Museum Schloss Klippenstein Radeberg for permission to use the image of Arldt and two anonymous reviewers for their feedback. EMD wishes to thank UNSW Sydney for an Australian Postgraduate Award.

References

- Anonymous (1921) Geologischen Vereinigung. *Geologische Rundschau*, 12, 277–288.
- Anonymous (1928) Verzeichnis der Mitglieder der Palaeontologischen Gesellschaft. *Palaeontologische Zeitschrift*, 7, 268–273.
- Anonymous (1937) Geologischen Vereinigung. *Geologische Rundschau*, 28, 382–383.
- Anonymous (1940) Geologische Vereinigung. *Geologische Rundschau*, 31, 319–320.
<https://doi.org/10.1007/BF01808410>
- Anonymous (1943) Mitglieder der Geologischen Vereinigung. *Geologische Rundschau*, 33, 511–534.
<https://doi.org/10.1007/BF02198647>
- Anonymous (1948) Geologische Vereinigung. *Geologische Rundschau*, 35, 66–79.
- Anonymous (1952) Persönliches. *Geologische Rundschau*, 40, 300.
- Anonymous (1961) Prof. Dr. Theodor Arldt gestorben. *Sächsische Heimatblätter*, 7, 124–125.
- Anonymous (2016a) Vor 40 Jahren—als das letzte ‘Radeberger Kulturleben’ erscheint. *Die Radeberger*, 26 (47), 8. Available from: http://www.die-radeberger.de/mediapool/138/1381409/data/Onlineausgaben_2016/Ausgabe_47_2016.pdf (Accessed 9 Aug. 2017)

-
31. To our knowledge Arldt never habilitated thereby disallowing him the opportunity to teach at universities and supervise students. Had he habilitated, like Wagner, he too could have privately lectured at universities as a *Privatdozent*.

- Anonymous (2016b) Der Tag des Friedhofes: Raum für Erinnerungen—Gedenken an Radeberg Chronisten. *Die Radeberger*, 26 (36), 3. Available from: http://www.die-radeberger.de/mediapool/138/1381409/data/Onlineausgaben_2016/Ausgabe_36_2016.pdf (Accessed 9 Aug. 2017)
- Anonymous (2017) Prof. Dr. Theodor Arldt (1878–1960)—eine Legende reist postum um die Welt. *Die Radeberger*, 27 (14), 8. Available from: http://www.die-radeberger.de/mediapool/138/1381409/data/Onlineausgaben_2017/Ausgabe_14_2017.pdf (Accessed 9 Aug. 2017)
- Arltd, T. (1901) *Über den Parallelismus der Küsten von Südamerika*. Naumann, Leipzig, 86 pp.
- Arltd, T. (1905) Die Gestalt der Erde. *Beiträge zur Geophysik*, 7, 283–326.
- Arltd, T. (1907) *Die Entwicklung der Kontinente und ihrer Lebewelt: ein Beitrag zur vergleichenden Erdgeschichte*. W. Engelmann, Leipzig, 729 pp.
- Arltd, T. (1909) Die historische Geographie der Lebewesen (Palaeobiogeographie). *Gaea*, 45, 38–49.
- Arltd, T. (1910) Methoden und Bedeutung der Palaeogeographie. *Petermanns Geographisch Mitteilungen*, 56, 229–233.
- Arltd, T. (1913) Palaeogeographie. *Handwörterbuch der Naturwissenschaften*, 4, 152–170.
- Arltd, T. (1914) Zur Geschichte der paläogeographischen Rekonstruktionen. *Geographische Zeitschrift*, 20, 197–208.
- Arltd, T. (1915) Die Stammesgeschichte der Primaten und die Entwicklung der Menschenrassen. *Fortschritte der Rassenkunde*, 1, 37–52.
- Arltd, T. (1916) Die territorialen Ansprüche Rumäniens und ihre völkischen und wirtschaftsgeographischen Grundlagen. *Geographische Zeitschrift*, 22, 545–556.
- Arltd, T. (1919–1921) *Handbuch der Palaeogeographie. Vols. 1 & 2*. Gebrüder Borntraeger, Leipzig, 1647 pp.
- Arltd, T. (1924) Tierverbreitung und Erdgeschichte. *Die Naturwissenschaften*, 20, 384–388.
<https://doi.org/10.1007/BF01493827>
- Arltd, T. (1929) Natürliche Verbündete: Mit drei Karten. *Zeitschrift für Politik*, 18, 485–491.
- Arltd, T. (1932) Tiergeographie und Hologenesis. *Geographische Zeitschrift*, 38, 412–417.
- Arltd, T. (1938) *Die Entwicklung der Kontinente und ihrer Lebewelt. 2nd Edition*. Gebrüder Borntraeger, Berlin, 1005 pp.
- Arltd, T. (1955) *Das Rödergebiet um Radeberg: Seifersdorfer Tal Reihe Unser kleines Wanderheft Heft 36*. VEB Bibliographisches Institut, Leipzig, 70 pp.
- Banda, G. (1957) Prof. Dr. Theodor Arldt. *Radeberger Kulturleben: Heimatschrift für Radeberg und Umgebung*, 2, 15.
- Bowler, J.P. (1996) *Life's Splendid Drama*. The University of Chicago Press, Chicago, 525 pp.
- Brundin, L. (1966) Transantarctic relationships and their significance as evidenced by midges. *Kungliga Svenska Vetenskapsakademiens Handlingar*, 11, 1–472.
- Bucher, W.H. (1963) Cryptoexplosion structures caused from without or from within the Earth? (“Astroblemes” or “Geoblemes?”). *American Journal of Science*, 261, 597–649.
<https://doi.org/10.2475/ajs.261.7.597>
- Craw, R.C. & Gibbs, G.W. (1984) Croizat's *Panbiogeography* and *Principia Botanica*. *Tuatara*, 27, 1–75.
- Dacqué, E. (1913) Paläogeographische Karten und die gegen sie zu erhebenden Einwände. *Geologische Rundschau*, 4, 186–206.
<https://doi.org/10.1007/BF01776876>
- Dacqué, E. (1915) *Grundlagen und Methoden der paläogeographie*. Gustav Fischer, Jena, 519 pp.
- Dana, J.D. (1863) *Manual of Geology: Treating of the Principles of the Science with special reference to American Geological History, for the use of Colleges, Academies, and Schools of Science*. Trübner & Co., London, 798 pp.
<https://doi.org/10.5962/bhl.title.61162>
- Dunbar, C.O. (1943) Charles Schuchert 1858–1942. *Science*, 97, 301–303.
<https://doi.org/10.1126/science.97.2518.301>
- du Toit, A.L. (1937) *Our Wandering Continents: An Hypothesis of Continental Drifting*. Oliver & Boyd, London, 366 pp.
- Ebach, M.C. (2015) *Origins of Biogeography*. Springer, New York, 173 pp.
<https://doi.org/10.1007/978-94-017-9999-7>
- Ebach, M.C. (2017) *The Reinvention of Australasian Biogeography: Reform, Revolt and Rebellion*. CSIRO Publishing, Melbourne, 180 pp.
- Emerson, B.K. (1917) Recurrent Tetrahedral Deformations and Intercontinental Torsions. *Proceedings of the American Philosophical Society*, 56, 445–472.
- Ehrenreich, E. (2007) *The Nazi Ancestral Proof: Genealogy, Racial Science, and the Final Solution*. Indiana University Press, Bloomington, 264 pp.
- Frankel, H.R. (2012) *The Continental Drift Controversy. Vol. 1*. Cambridge University Press, Cambridge, 604 pp.
- Frech, F. (1908) Die Entwicklung der Kontinente und ihrer Lebewelt. Nach Arldt. *Geographische Zeitschrift*, 14, 327–336.
- Gebauer, H.-W. & Altmann, K. (1999) *Die Reihe Archivbilder Radeberg*. Sutton Verlag GmbH, Erfurt, 128 pp.
- Genthe, M.K. (1910) Die Entwicklung der Kontinente und ihrer Lebewelt by Theodor Arldt. *Bulletin of the American Geographical Society*, 42, 295–296.
- Gotte, W. (1989) Theodor Arldt (1878–1960). Ein Pionier der Paläogeographie. *Abhandlungen des Staatlichen Museums für Mineralogie und Geologie zu Dresden*, 39, 125–130.
- Greene, M.T. (1984) Alfred Wegener. *Social Research*, 51, 739–761.
- Greene, M.T. (2015) *Alfred Wegener: Science, Exploration, and the Theory of Continental Drift*. Johns Hopkins University, Maryland, 696 pp.
- Gregory, J.W. (1908) A history of geographical evolution. *Nature*, 78, 266–267.
<https://doi.org/10.1038/078266a0>
- Hallam, A. (1967) The bearing of certain palaeozoogeographic data on continental drift. *Palaeogeography, Palaeoclimatology*,

- Palaeoecology*, 3, 201–241.
[https://doi.org/10.1016/0031-0182\(67\)90017-X](https://doi.org/10.1016/0031-0182(67)90017-X)
- Haug, É. (1907) *Traité de Géologie*. Armand Colin, Paris, 546 pp.
- H.H.R. (1937) Aspects of palaeogeography. *Nature*, 139, 902–903.
- Hoffmann, P.F. (2012) The Tooth of Time: Alfred Wegener. *Geoscience Canada*, 39, 102–111.
- Hofsten, N.G.E. von (1916) Zur älteren Geschichte des Diskontinuitätsproblems in der Biogeographie. *Zoologische Annalen Zeitschrift für Geschichte der Zoologie*, 7, 197–353.
- Jacoby, W. & Wutzke, U. (2015) Alfred Wegener – einhundert Jahre Mobilismus. *Geofokus*, 54, 6–16.
- Jaekel, O. (1914) Verzeichnis der Mitglieder der Palaeontologischen Gesellschaft 1913. *Palaeontologische Zeitschrift*, 1, 438–446.
<https://doi.org/10.1007/BF03160352>
- J.D.M. (1937) Book review. *The Geographical Journal*, 90, 83–84. [unkown surname]
- Kayser, E. (1909) *Lehrbuch der Geologie. Vol. 1*. Ferdinand Enke, Stuttgart, 688 pp.
- Kerner-Marilaun, F. (1934) *Paläogeographie mit besonderer Rücksicht auf die Fehlerquellen*. Gebrüder Borntraeger, Berlin, 410 pp.
- Kölbl-Ebert, M. (2016) *From Local Patriotism to a Planetary Perspective: Impact Crater Research in Germany, 1930s–1970s*. Routledge, London, 402 pp.
- Kossmat, F. (1908) *Paläogeographie: Geologische Geschichte Der Meere Und Festlander*. A.J. Götschen'sche, Leipzig, 136 pp.
- Kossmat, F. (1936) *Paläogeographie und Tektonik*. Gebrüder Borntraeger, Berlin, 413 pp.
- Krumbein, W.C. (1936) Paläogeographie. Fritz Kerner-Marilaun. *Journal of Geology*, 44, 223–223.
<https://doi.org/10.1086/624423>
- Le Grande, H.E. (1988) *Drifting Continents and Shifting Theories: The Modern Revolution in Geology and Scientific Change*. Cambridge University Press, Cambridge, 313 pp.
- Lehto, O. (1998). *Mathematics without borders: A History of the International Mathematical Union*. Springer Verlag, New York, 399 pp.
<https://doi.org/10.1007/978-1-4612-0613-2>
- Martin, G.J. (2015) *American Geography and Geographers: Toward Geographical Science*. Oxford University Press, Oxford, 1210 pp.
- Moran, N. (2012) From the natural attitude to the Life-World. In: Embree, L. & Nenon, T. (Eds.), *Husserl's Ideen*. Springer Science & Business Media, New York, pp. 105–124.
https://doi.org/10.1007/978-94-007-5213-9_7
- Neumayr, M. (1885) Die geographische Verbreitung der Juraformation. *Denkschriften der Kaiserlichen Akademie der Wissenschaften. Mathematisch-naturwissenschaftliche Classe*, 50, 57–142.
- Oreskes, N. (1999) *The Rejection of Continental Drift Theory and Method in American Earth Science*. Oxford University Press, Oxford, 403 pp.
- P.L. (1938) Book review. *Geological Magazine*, 75, 89–90. [unkown surname]
- R.L. (1908) Book review. *The Geographical Journal*, 32, 173–174. [unkown surname]
- Rastall, R.H. (1929) On Continental drift. *Geological Magazine*, 66, 447–456.
- Reinbothe, R. (2006) *Deutsch als internationale Wissenschaftssprache und der Boykott nach dem Ersten Weltkrieg*. Peter Lang, Frankfurt, 489 pp.
- Reinbothe, R. (2013) Der Boykott gegen die deutschen Wissenschaftler und die deutsche Sprache nach dem Ersten Weltkrieg. *Deutsche Medizinische Wochenschrift*, 138, 2685–2690.
<https://doi.org/10.1055/s-0033-1359937>
- Schram, F.R. (1982) Medalists of the Paleontological Society. *Journal of Paleontology*, 56, 469–476.
- Schuchert, C. (1910) Paleogeography of North America. *Bulletin of the Geological Society of America*, 20, 427–606.
<https://doi.org/10.1130/GSAB-20-427>
- Schuchert, C. (1935) *Historical Geology of the Antillean-Caribbean Region: Or the Lands Bordering the Gulf of Mexico and the Caribbean Sea*. Wiley & Son, New York, 811 pp.
- Siegmund-Schultze, R. (2009) *Mathematicians Fleeing from Nazi Germany: Individual Fates and Global Impact*. Princeton University Press, New Jersey, 471 pp.
- Suess, E. (1883–1904) *Das Antlitz der Erde. Vol. 1–5*. G. Freytag, Leipzig, 2930 pp.
- Wagenbreth, O. (2014) *Geschichte der Geologie in Deutschland*. Springer Verlag, Berlin, 264 pp.
<https://doi.org/10.1007/978-3-662-44712-3>
- Wagner, G. (1938) Book Review. *Geographische Zeitschrift*, 44, 26.
- Wagner, G. (1962) Das Ries, kein Meteoritenkrater. *Jahreshefte des Vereins für vaterländische Naturkunde in Württemberg*, 117, 17–18.
- Wallace, A.R. (1876) *The geographical distribution of animals; with a study of the relations of living and extinct faunas as elucidating the past changes of the earth's surface. Vols. 1 & 2*. Harper & Brothers, New York, 1110 pp.
<https://doi.org/10.5962/bhl.title.46581>
- Wegener, A. (1912) Die Entstehung der Kontinente. *Geologische Rundschau*, 3, 276–292.
<https://doi.org/10.1007/BF02202896>
- Wegener, A. (1924) *The origin of continents and oceans*. Methuen & Co, London, 212 pp. [translated by Skerl, J.G.A.]